

CLAIMS

1. A liquid crystal display device which carries out emphasis conversion on video data supplied to a liquid crystal display panel in accordance with at least video data of previous vertical period and video data of current vertical period, thereby compensating for optical response properties of the liquid crystal display panel,

the liquid crystal display device comprising:

I/P conversion means which, when incoming video data is an interlaced signal, converts the interlaced signal into video data of a progressive signal in accordance with any one of two or more conversion methods; and

emphasis conversion means which carries out emphasis conversion on video data of current vertical period so as to emphasize grayscale transition at least from previous vertical period to current vertical period in the progressive signal,

wherein a degree of the emphasis conversion on the video data is controlled so as to be changed in accordance with which kind of conversion method among the two or more conversion methods is used for the conversion.

2. The liquid crystal display device according to claim 1, further comprising:

table memory which stores an emphasis conversion

parameter determined by video data of current vertical period
and video data of previous vertical period,

the emphasis conversion means having:

an operation section which performs emphasis operation
5 on the video data by using the emphasis conversion
parameter; and

a multiplying section which multiplies output data
obtained by the emphasis operation by a coefficient varying
depending upon which kind of conversion method among the
10 two or more conversion methods is used for the conversion.

3. The liquid crystal display device according to claim 1,
further comprising:

table memory which is referenced to when incoming
15 video data is converted by a first conversion method, and
stores an emphasis conversion parameter determined by video
data of current vertical period and video data of previous
vertical period; and

table memory which is referenced to when incoming
20 video data is converted by a second conversion method, and
stores an emphasis conversion parameter determined by video
data of current vertical period and video data of previous
vertical period,

the emphasis conversion means having:

25 an operation section which performs emphasis operation

on the video data obtained by the conversion by using the emphasis conversion parameter which is read from the table memory determined by which kind of conversion method among the two or more conversion methods is used for the conversion.

4. The liquid crystal display device according to claim 1, further comprising:

temperature detection means which detects a device internal temperature,

the emphasis conversion means changing the degree of emphasis conversion performed on the video data in accordance with a detection result of the device internal temperature.

5. The liquid crystal display device according to claim 4, further comprising:

table memory which stores an emphasis conversion parameter determined by video data of current vertical period and video data of previous vertical period,

the emphasis conversion means having:

an operation section which performs emphasis operation on the video data obtained by the conversion, by using the emphasis conversion parameter; and

a multiplying section which multiplies output data

supplied from the operation section by a coefficient varying depending upon (i) which kind of conversion method among the two or more conversion methods is used for the conversion and (ii) a detection result of the device internal temperature.

6. The liquid crystal display device according to claim 4, further comprising:

table memory which is referenced to when incoming video data is converted by a first conversion method, and stores an emphasis conversion parameter determined by video data of current vertical period and video data of previous vertical period; and

table memory which is referenced to when incoming video data is converted by a second conversion method, and stores an emphasis conversion parameter determined by video data of current vertical period and video data of previous vertical period,

the emphasis conversion means having:

an operation section which performs emphasis operation on the video data obtained by the conversion by using the emphasis conversion parameter which is read from the table memory determined by which kind of conversion method among the two or more conversion methods is used for the conversion; and

a multiplying section which multiplies output data obtained by the emphasis operation by a coefficient varying depending upon a detection result of the device internal temperature.

5

7. The liquid crystal display device according to claim 4, further comprising:

10 table memories which are referenced to when incoming video data is converted by a first conversion method, and store emphasis conversion parameters respectively associated with a plurality of device internal temperatures, the emphasis conversion parameters each being determined by video data of current vertical period and video data of previous vertical period; and

15 table memories which are referenced to when incoming video data is converted by a second conversion method, and store emphasis conversion parameters respectively associated with a plurality of device internal temperatures, the emphasis conversion parameters each being determined by video data of
20 current vertical period and video data of previous vertical period,

the emphasis conversion means having:

25 an operation section which performs emphasis operation on the video data obtained by the conversion by using the emphasis conversion parameter which is read from the table

memory determined by (i) which kind of conversion method among the two or more conversion methods is used for the conversion and (ii) a detection result of the device internal temperature.

5

8. The liquid crystal display device according to claim 4, further comprising:

10 table memories which store emphasis conversion parameters respectively associated with a plurality of device internal temperatures, the emphasis conversion parameters each being determined by video data of current vertical period and video data of previous vertical period; and

 the emphasis conversion means having:

15 an operation section which performs emphasis operation on the video data obtained by the conversion by using the emphasis conversion parameter which is read from the table memory determined by a result of comparison between (i) a switching temperature determined by which kind of conversion method among the two or more conversion
20 methods is used for the conversion and (ii) a detection result of the device internal temperature.

9. The liquid crystal display device according to claim 8, further comprising:

25 an operation section which performs a predetermined

operation on temperature data that is the detection result of the device internal temperature, the operation being determined for each of the two or more conversion methods;

5 a comparison section which compares between the temperature data having been subjected to the operation and given threshold temperature data determined in advance; and

10 a control signal output section which generates a switching control signal for controlling switching of the emphasis conversion parameters, in accordance with a result of the comparison.

10. The liquid crystal display device according to claim 8, further comprising:

15 a comparison section which compares between temperature data that is the detection result of the device internal temperature and a given threshold temperature data determined for each of the two or more conversion methods; and

20 a control signal output section which generates a switching control signal for controlling switching of the emphasis conversion parameters, in accordance with a result of the comparison.

25 11. A signal processing unit for use in a liquid crystal display device, the signal processing unit comprising:

conversion means which converts an interlaced video signal into a progressive video signal; and

correction means which corrects a video signal of current vertical period so as to emphasize grayscale transition at least from previous vertical period to current vertical period in the progressive video signal,

wherein the conversion means is capable of conversions by two or more conversion methods, and

a degree of the grayscale transition emphasis performed by the correction means is changed in accordance with a conversion method used by the conversion means.

12. The signal processing unit for use in a liquid crystal display device according to claim 11, wherein:

the two or more conversion methods include a first conversion method of performing motion detection between fields and a second conversion method of performing conversion in a given procedure regardless of presence or absence of motion between fields, and

in a case where the conversion means performs conversion by the second conversion method, a degree of grayscale transition emphasis performed by the correction means is changed to be lower than in a case where the conversion means performs conversion by the first conversion method.

13. The signal processing unit for use in a liquid crystal display device according to claim 11, wherein:

the two or more conversion methods include a first
5 conversion method of performing conversion by motion prediction between fields and a second conversion method of performing conversion in a given procedure regardless of presence or absence of motion between fields, and

in a case where the conversion means performs
10 conversion by the second conversion method, a degree of grayscale transition emphasis performed by the correction means is changed to be lower than in a case where the conversion means performs conversion by the first conversion method.

15
14. The signal processing unit for use in a liquid crystal display device according to claim 11, wherein:

the two or more conversion methods include a first
conversion method of referencing to a video signal of other
20 field for conversion and a second conversion method of not referencing to a video signal of other field for conversion, and

in a case where the conversion means performs
conversion by the second conversion method, a degree of
grayscale transition emphasis performed by the correction
25 means is changed to be lower than in a case where the

conversion means performs conversion by the first conversion method.

15. The signal processing unit for use in a liquid crystal display device according to claim 12, 13, or 14, wherein:

the second conversion method is a method of copying a video signal in a certain field, or averaging sets of video signals in a certain field or averaging sets of video signals in a certain field while being weighted, so as to convert the video signal in the field into a progressive video signal.

16. The signal processing unit for use in a liquid crystal display device according to any one of claims 11 through 14, wherein:

the correction means includes a plurality of table memories each of which stores emphasis conversion parameter determined by at least the video signal of previous vertical period and the video signal of current vertical period, and

the table memories referenced to by the correction means are switched in accordance with a conversion method used by the conversion means, so that the degree of the grayscale transition emphasis is changed.

17. The signal processing unit for use in a liquid crystal

display device according to any one of claims 11 through 14,
wherein:

5 the correction means includes: a table memory which
stores an emphasis conversion parameter determined by at
least the video signal of previous vertical period and the video
signal of current vertical period; and adjustment means which
adjusts a correction amount for the video signal of current
vertical period in accordance with the degree of grayscale
transition emphasis, the correction amount being determined
10 with reference to the table memory.

18. The signal processing unit for use in a liquid crystal
display device according to any one of claims 11 through 14,
wherein:

15 the degree of grayscale transition emphasis performed by
the correction means is changed in accordance with not only
the conversion method used by the conversion means but also
a device internal temperature.

20 19. The signal processing unit for use in a liquid crystal
display device according to claim 18, wherein:

 the correction means includes a plurality of table
memories each of which stores emphasis conversion
parameter determined by at least the video signal of previous
25 vertical period and the video signal of current vertical period,

and

the table memories referenced to by the correction means are switched in accordance with (a) a conversion method used by the conversion means and (b) a device internal temperature, so that the degree of the grayscale transition emphasis is changed.

20. The signal processing unit for use in a liquid crystal display device according to claim 18, wherein:

the correction means includes a plurality of table memories each of which stores an emphasis conversion parameter determined by at least the video signal of previous vertical period and the video signal of current vertical period,

the correction means further includes adjustment means which adjusts a correction amount for the video signal of current vertical period, the correction amount being determined with reference to any one of the table memories, and

a degree of the adjustment performed by the adjustment means is changed in accordance with a device internal temperature, and the table memories referenced to by the correction means are switched in accordance with a conversion method used by the conversion means, so that the degree of the grayscale transition emphasis is changed.

21. The signal processing unit for use in a liquid crystal display device according to claim 18, wherein:

the correction means includes a plurality of table memories each of which stores an emphasis conversion parameter determined by at least the video signal of previous vertical period and the video signal of current vertical period,

at least part of the table memories are shared between the two or more conversion methods used by the conversion means, and

the table memories referenced to by the correction means are switched in accordance with a device internal temperature, and switching temperatures for switching between the table memories are changed in accordance with a conversion method used by the conversion means, so that the degree of the grayscale transition emphasis is changed.

22. The signal processing unit for use in a liquid crystal display device according to claim 21, wherein:

the table memories are switched in such a manner that part of the table memories is referenced to only when the conversion means performs conversion by a particular conversion method.

23. A signal processing unit for use in a liquid crystal display device, the signal processing unit including

conversion means which converts an interlaced video signal into a progressive video signal and modulating the progressive video signal so as to emphasize grayscale transition in each pixel of the liquid crystal display device,

5 wherein the conversion means is capable of conversions by two or more conversion methods, and

 a degree of the grayscale transition emphasis is changed in accordance with a conversion method used by the conversion means.

10

24. A liquid crystal display device including the signal processing unit according to any one of claims 11 through 14 and claim 23.

15

25. A liquid crystal display device having an I/P conversion means which, when incoming video data is an interlaced signal, converts the interlaced signal into video data of a progressive signal in accordance with any one of two or more conversion methods,

20

said liquid crystal display device, carrying out emphasis conversion on video data supplied to a liquid crystal display panel in accordance with at least video data of previous vertical period and video data of current vertical period, so as to emphasize grayscale transition at least from previous
25 vertical period to current vertical period in the progressive

signal, thereby compensating for optical response properties of the liquid crystal display panel, and

controlling a degree of the emphasis conversion on the video data so as to be changed in accordance with which kind of conversion method among the two or more conversion
5 methods is used for the conversion.

26. A program causing a computer to execute a process of controlling a degree of emphasis conversion on video data
10 so as to be changed in accordance with which kind of conversion method among two or more conversion methods is used for the conversion,

the computer controlling a liquid crystal display device comprising: an I/P conversion means which, when incoming
15 video data is an interlaced signal, converts the interlaced signal into video data of a progressive signal in accordance with any one of two or more conversion methods; and emphasis conversion means which carries out emphasis conversion on video data of current vertical period so as to
20 emphasize grayscale transition at least from previous vertical period to current vertical period in the progressive signal, and the liquid crystal display device carrying out emphasis conversion on video data supplied to a liquid crystal display panel in accordance with at least video data of previous
25 vertical period and video data of current vertical period,

thereby compensating for optical response properties of the liquid crystal display panel.

27. A program causing a computer comprising:
5 conversion means which converts an interlaced video signal into a progressive video signal; and correction means which corrects a video signal of a current vertical period so as to emphasize grayscale transition at least from current vertical period to previous vertical period in the progressive video
10 signal, wherein the conversion means is capable of conversions by two or more conversion methods,

to operate so as to change a degree of grayscale transition emphasis performed by the correction means in accordance with a conversion method used by the conversion
15 means.

28. A storage medium storing the program according to claim 26 or 27.

20 29. A liquid crystal display control method of carrying out emphasis conversion on video data supplied to a liquid crystal display panel in accordance with at least video data of previous vertical period and video data of current vertical period, thereby compensating for optical response properties
25 of the liquid crystal display panel,

the method comprising the steps of:

when incoming video data is an interlaced signal,
converting the interlaced signal into video data of a
progressive signal in accordance with any one of two or more
conversion methods; and

carrying out emphasis conversion on video data of the
current vertical period so as to emphasize grayscale transition
at least from previous vertical period to current vertical
period in the progressive signal,

wherein a degree of the emphasis conversion on the
video data is controlled so as to be changed in accordance
with which kind of conversion method among the two or more
conversion methods is used for the conversion.

30. A liquid crystal display control method comprising:

a conversion step of converting an interlaced video
signal into a progressive video signal; and

a correction step of correcting a video signal of current
vertical period so as to emphasize grayscale transition at
least from current vertical period to previous vertical period
in the progressive video signal,

wherein conversions by two or more conversion methods
are possible in the conversion step,

the method further comprising:

a control step of changing a degree of the grayscale

transition emphasis performed by the correction means in accordance with a conversion method used in the conversion step.

5 31. A liquid crystal display control method of including a conversion step of converting an interlaced video signal into a progressive video signal, and modulating the progressive video signal so as to emphasize grayscale transition in each pixel of a liquid crystal display device,

10 wherein conversions by two or more conversion methods are possible in the conversion step, and

 a degree of the grayscale transition emphasis is changed in accordance with a conversion method used in the conversion step.

15 32. A liquid crystal display control method including an I/P conversion step of, when incoming video data is an interlaced signal, converting the interlaced signal into video data of a progressive signal in accordance with any one of two
20 or more conversion methods,

 said method carrying out emphasis conversion on video data supplied to a liquid crystal display panel in accordance with at least video data of previous vertical period and video data of current vertical period, so as to emphasize grayscale
25 transition at least from previous vertical period to current

vertical period in the progressive signal, thereby compensating for optical response properties of the liquid crystal display panel, wherein

5 a degree of the emphasis conversion on the video data is controlled so as to be changed in accordance with which kind of conversion method among the two or more conversion methods is used for the conversion.